CLAIMS

1. A method of calculating an outer diameter of a wire packing which is formed by bundling and packing a plurality of wires into a smallest possible circular shape so as not to overlap each other, the method comprising:

an including-circle assuming step of assuming an including circle which includes a plurality of circles arranged in a plane so as not to over lap each other by assuming that cross-sectional shapes of the plurality of wires are the plurality of circles having diameters corresponding to respective outer shapes thereof;

a target-circle defining step of determining a target circle which has the same center as that of the including circle and is slightly smaller than the including circle, and from which at least one of the plurality of circles protrudes;

a searching step of setting the circle protruding from the target circle as insertion trial circle, and searching positions to which the plurality of circles other than the insertion trial circle can be moved as distantly as possible within the target circle without overlapping each other;

an inserting step of inserting the insertion trial circle in a space in the target circle created by changing a layout of the plurality of circles on the basis of a result of search in the searching step; and

a first search controlling step setting a new target

circle which is slightly smaller than the present one and has the insertion trial circle and returns to the searching step if all the insertion trial circles have been inserted in the target circle,

wherein the including circle is made gradually small by repeatedly executing the target-circle defining step, the searching step, the inserting step, and the first search controlling step.

2. The method according to claim 1, wherein, in the searching step, a circle Voronoi diagram is constructed by a circle set excluding the insertion trial circle and one of the plurality of circle, and the target circle, and an examination is made with respect to the plurality of circles other than the insertion trial circle as to whether or not a center of the one circle tangent to both side circles forming each of boundary edges in the circle Voronoi diagram is located on the boundary edge, to thereby search positions to which the circles can be moved within the target circle.

3. The method according to claim 1 further comprising:

a second search controlling step which is repeatedly executed together with the target-circle defining step, the searching step, the inserting step, and the first search controlling step, wherein where the insertion of the insertion

trial circle is impossible, the operation returns to the searching step after determining a new target circle which is of an intermediate size between the including circle and the present target circle and which has the insertion trial circle.

4. An apparatus for calculating an outside diameter of a wire packing which is formed by bundling and packing a plurality of wires into the smallest possible circular shape so as not to overlap each other, the apparatus comprising:

including-circle assuming means for assuming an including circle which includes a plurality of circles arranged in a plane so as not to overlap each other by assuming that cross-sectional shapes of the plurality of wires are the plurality of circles having diameters corresponding to respective outer shapes thereof;

target-circle defining means for determining a target circle which has the same center as that of the including circle and is slightly smaller than the including circle, and from which at least one of the plurality of circles protrudes;

searching means in which the circle protruding from the target circle is set as an insertion trial circle, and positions are searched to which the plurality of circles other than the insertion trial circle can be moved as distantly as possible within the target circle without overlapping each other;

inserting means for inserting the insertion trial circle

in a space in the target circle created by changing the layout of the plurality of circles on the basis of a result of search by the searching means;

first search controlling means in which in a case where all the insertion trial circles have been inserted in the target circle, a new target circle which is slightly smaller than a present one and has the insertion trial circle is set, and the search by the searching means is then effected;

input means for inputting initial information concerning the plurality of wires; and

output means for outputting at least the outside diameter of the including circle.

5. The apparatus according to claim 4, wherein the output means outputs position information on the including circle and the plurality of circles.

6. The apparatus according to claim 4 or 5, wherein the searching means includes second searching means in which a circle Voronoi diagram is constructed by a circle set excluding the insertion trial circle and one of the plurality of circle, and the target circle, and in which an examination is made with respect to the plurality of circles other than the insertion trial circle as to whether or not a center of the one circle tangent to both side circles forming each of boundary edges in

the circle Voronoi diagram is located on the boundary edge, to thereby search positions to which the circles can be moved within the target circle.

7. The apparatus according to claim 4, further comprising: second search controlling means which, in a case where the insertion of the insertion trial circle is impossible, causes the search by the searching means to be effected after determining a new target circle which is of an intermediate size between the including circle and the present target circle and which has the insertion trial circle.

8. A computer readable recording medium storing a program by which the following means are implemented by a computer for calculating an outside diameter of a wire packing which is formed by bundling and packing a plurality of wires into the smallest possible circular shape so as not to overlap each other:

including-circle assuming means for assuming an including circle which includes a plurality of circles arranged in a plane so as not to overlap each other by assuming that cross-sectional shapes of the plurality of wires are the plurality of circles having diameters corresponding to respective outer shapes thereof;

target-circle defining means for determining a target

circle which has the same center as that of the including circle and is slightly smaller than the including circle, and from which at least one of the plurality of circles protrudes;

searching means in which the circle protruding from the target circle is set as an insertion trial circle, and positions are searched to which the plurality of circles other than the insertion trial circle can be moved as distantly as possible within the target circle without overlapping each other;

inserting means for inserting the insertion trial circle in a space in the target circle created by changing the layout of the plurality of circles on the basis of a result of search by the searching means;

first search controlling means in which in a case where all the insertion trial circles have been inserted in the target circle, a new target circle which is slightly smaller than a present one and has the insertion trial circle is set, and the search by the searching means is then effected;

input means for inputting initial information concerning the plurality of wires; and

output means for outputting at least the outside diameter of the including circle.